

## **REMARKS**

The Applicant thanks the Examiner and Examiner's Supervisor for the courtesy of a telephonic interview, conducted with the inventor Roger Malik, and inventor's representatives, David Hill and Caitlin Hogan, on August 18, 2009, where claims 1, 2, 49, 50, 101, and 102 were discussed in light of the '721 and '500 references, as well as the performance features of the invention were discussed.

Claims 1-4, 8-19, 21-24, 26-31, 40-59, 63-78, 81-83, 92-113, 115-131, and 133-155 are pending in this application. By this amendment, the Applicants have amended claims 1, 3, 21-22, 29-30, 41, 46, 49,52, 56-57, 83, 98, 101, 106, 110-111, 115-118, 134, and 149-150 without prejudice. The Applicants respectfully submit that claims 1, 3, 21-22, 29-30, 41, 46, 49,52, 56-57, 83, 98, 101, 106, 110-111, 115-118, 134, and 149-150 do not contain new matter, and that the invention, as defined by claims 1-4, 8-19, 21-24, 26-31, 40-59, 63-78, 81-83, 92-113, 115-131, and 133-155 is patentable over the prior art.

Based on the foregoing amendments and the following Remarks, the application is deemed to be in condition for allowance and action to that end is respectfully requested.

### **I. THE 35 U.S.C. §102 REJECTIONS AND "FORMAL" MATTERS**

The Examiner has objected to the drawings under 37 C.F.R. 1.8(a) and asserts that the drawings must show every feature of the invention specified in the claims. According to the Examiner, "a micrometer screw attached to a linear motion vacuum feedthrough attached to a shaft driving said piston", as claimed in claims 41, 46, 93, 98, 145, and 150, is missing from the drawings.

The Examiner further asserts that claims 101-113, 115-131, 133-135, 144-152, and 154 are rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement and the enablement requirement. The Examiner also asserts that claims 29-31, 41-42, 46, 98, 150, 21, 56, 110, 115-118, 149, 3, 22, 52, 57, 83, 106, 111, and 134 are rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicants regard as the invention.

As noted above, the Applicant has amended drawing sheets 5 and 6 to include the micrometer screw feature as required in claims 41, 46, 93, 98, 145, and 150. The Applicant respectfully submits that the above amendments to the aforementioned drawings provides the clarification sought by the Examiner. In view of the foregoing, the Applicant respectfully requests that the Examiner's objection to claims 41, 46, 93, 98, 145, and 150 be withdrawn,

Also as noted above, the Applicant had amended claims 3, 21-22, 29-30, 41, 46, 52, 56-57, 83, 98, 106, 110-111, 115-118, 134, and 150 in order to overcome the 35 U.S.C. § 112, second paragraph rejections. The Applicant respectfully submits that the above amendments to each of the respective claims provides the clarification sought by the Examiner. In view of the foregoing, Applicant respectfully submits that claims 3, 21-22, 29-30, 41, 46, 52, 56-57, 83, 98, 106, 110-111, 115-118, 134, and 150, are in compliance with 35 U.S.C. §112, and requests that the Examiner's 35 U.S.C. §112 rejection of claims 3, 21-22, 29-30, 41, 46, 52, 56-57, 83, 98, 106, 110-111, 115-118, 134, and 150 be withdrawn.

## **II. THE 35 U.S.C. § 103 REJECTIONS:**

The Examiner asserts that Claims 1-2, 9-17, 19-40, 43-45, 47-51, 55, 67-76, 78, 92, 95-97, 99-100, 153, and 155 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Saito,

Japanese Pat. No. JP 62-237721 (hereinafter “Saito”), in view of DeLange, U.S. Patent No. 2,508,500 (hereinafter “DeLange”), and in further view of Mercer, U.S. Patent No. 5,407,000 (hereinafter “Mercer”). The Examiner further asserts that claims 8, 66, 77, 101-105, 107, 109, 115-116, 118-131, 144, 147-149, 151-152, and 154 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, further in view of Colombo, U.S. Patent No. 5,827,371 (hereinafter “Colombo”). The Examiner asserts that claims 3, 18, and 52-53 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, further in view of David, U.S. Patent No. 4,672,813 (hereinafter “David”). The Examiner further asserts that claim 106 is rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, Colombo, further in view of David. The Examiner further asserts that claims 4 and 54 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, further in view of Finicle, U.S. Patent No. 5,158,750 (hereinafter “Finicle”). The Examiner asserts that claim 108 is rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, Colombo, further in view of Finicle. The Examiner further asserts that claims 21-22, and 56-57 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, further in view of Bullough et al., U.S. Patent No. 4,072,599 (hereinafter “Bullough”). The Examiner further asserts that claims 110 and 111 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, Colombo, further in view of Bullough. The Examiner asserts that claims 23-24, 26-27, 58-59, and 112-113 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, Bullough, further in view of Colombo, in further view of Bahney, U.S. Patent No. 2,195,071 (hereinafter “Bahney”). The Examiner further asserts that claims 63-65 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, further in view of Ueno, U.S. Patent No. 6,279,330 (hereinafter “Ueno”). The

Examiner asserts that claim 28 is rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, Bullough, further in view of Bahney. The Examiner asserts that claim 117 is rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, Bullough, Colombo, further in view of Ueno. The Examiner also asserts that claims 29-31 and 81-83 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, in view of Leycuras, U.S. Pat. App. Pub. No. 2004/0238526 (hereinafter “Leycuras”). The Examiner further asserts that claims 133-135 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, Bullough, Colombo, further in view of Ueno. The Examiner asserts that claims 41-42, 46, 93-94, and 98 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, further in view of Natelson, U.S. Patent No. 3,687,632 (hereinafter “Natelson”), in further view of Bacchi et al., U.S. Pat. App. Pub. No. 2003/0055533 (hereinafter “Bacchi”). The Examiner asserts that claims 145-146 and 150 are rejected under 35 U.S.C. § 103(a) as being unpatentable Saito, DeLange, Mercer, Bullough, Colombo, further in view of Natelson and Bacchi.

As noted above, the Applicant has amended claims 1, 3, 21-22, 29-30, 41, 46, 49, 52, 56-57, 83, 98, 101, 106, 110-111, 115-118, 134, and 149-150 so as to more clearly distinguish the invention, as defined by such claims, over the prior art. The Applicant therefore respectfully submits that the invention, as claimed in claims 1-4, 8-19, 21-24, 26-31, 40-59, 63-78, 81-83, 92-113, 115-131, and 133-155, is patentable over the known prior art, including the cited references.

The Applicant submits that support for the limitations in independent claims 1, 49, and 101 is inherently or expressly disclosed in the specification of U.S. Patent Pub. No. 2005/0229856 (Application No. 10/829,148) in at least paragraphs [0047]-[0054], [0069]-[0072], and [0087]-[0088].

The Applicant respectfully submits that Saito, DeLange, Mercer, Colombo, David, Finicle, Bullough, Bahney, Ueno, Leycuras, Natelson, Bacchi, and any combination thereof, do not disclose, teach, or suggest a liquid metal evaporation source comprising “an evaporator configured to evaporate liquid metal, said evaporator comprising a first heater element of a plurality of heater elements for maintaining said evaporator at a first temperature”, “a hollow reservoir cylinder for holding said liquid metal”, “wherein said hollow reservoir cylinder comprises a cylindrical piston, said reservoir cylinder comprises a third heater element of said plurality of heater elements for maintaining said liquid metal at a third temperature”, “wherein said third temperature being lower than said first temperature for holding said liquid metal in a liquid form”, “a hollow transport tube for transporting said liquid metal from said hollow reservoir cylinder to said evaporator”, “wherein said hollow transport tube includes a second heater element of said plurality of heater elements for maintaining said hollow transport tube at a second temperature”, “wherein said second temperature being less than said first temperature and greater than said third temperature, said hollow transport tube connecting said evaporator and said reservoir cylinder”, “at least one conducting probe configured to measure and regulate a height of said liquid metal within said evaporator”, “wherein each of said plurality of heater elements includes a thermocouple configured to sense the temperature and control the temperature of said plurality of heater elements”, “wherein said reservoir cylinder and said piston are configured to prevent leakage of liquid metal through the mating surfaces of said reservoir cylinder and said piston”, “wherein said at least one conducting probe is configured to sense contact with liquid metal in said evaporator by making a low resistance electrical contact”, “wherein said conducting probe controls a position of said piston in said reservoir cylinder via an automatic feedback control circuit to regulate the level of said liquid metal in said evaporator to

maintain a constant evaporation rate of said liquid metal from said evaporator at a fixed evaporator temperature and controls a position of said piston in said reservoir cylinder to transport said liquid metal from said reservoir cylinder to said evaporator if said conducting probe receives a signal from said automatic feedback control circuit”, “wherein said signal is indicative of said liquid metal being depleted in said evaporator”, “wherein said reservoir cylinder, said transport tube, and said evaporator are integrally connected within a vacuum system configured to melt, transport, and evaporate liquid metal at very high temperatures up to 2500 C”, all of which are specifically recited features of independent claim 1.

In view of the foregoing, the Applicant respectfully submit that Saito, DeLange, Mercer, Colombo, David, Finicle, Bullough, Bahney, Ueno, Leycuras, Natelson, Bacchi, and any combination of same, do not disclose, teach, or suggest, all of the specifically recited features of independent claim 1, and, therefore, the invention as defined by independent claim 1, is patentable over Saito, DeLange, Mercer, Colombo, David, Finicle, Bullough, Bahney, Ueno, Leycuras, Natelson, Bacchi, and any combination thereof.

The Applicant further submits that claims 2-4, 8-19, 21-24, 26-31, and 40-48, all of which depend either directly or indirectly from independent claim 1, and therefore include all of the limitations of independent claim 1, are also patentable over the prior art as they depend from allowable subject matter.

The Applicant submits that Saito, DeLange, Mercer, Colombo, David, Finicle, Bullough, Bahney, Ueno, Leycuras, Natelson, Bacchi, and any combination thereof, do not disclose, teach, or suggest a liquid metal evaporation source comprising “a first zone maintained at a first temperature”, “a second zone maintained at a second temperature lower than said first temperature”, “a third zone maintained at a third temperature lower than said second

temperature”, “a conducting probe to sense a level of a liquid metal in said liquid metal evaporation source”, “wherein each of said first, second and third zones include a heater element for sensing and regulating said first, second and third temperatures of said first, second and third zones to prevent solidification of a liquid metal”, “wherein said first, second and third zones are in fluid communication”, “wherein said conducting probe transmits a signal to said evaporation source”, “wherein said signal is indicative of said level of said liquid metal in said evaporation source”, “wherein said signal is indicative of said level of said liquid metal being below a threshold level”, “wherein said first, said second, and said third zones are integrally connected within a vacuum system configured to melt, transport, and evaporate liquid metal at very high temperatures up to 2500 C”, all of which are specifically recited features of independent claim 49.

In view of the foregoing, the Applicant respectfully submits that Saito, DeLange, Mercer, Colombo, David, Finicle, Bullough, Bahney, Ueno, Leycuras, Natelson, Bacchi, and any combination of same, do not disclose, teach, or suggest, all of the specifically recited features of independent claim 49, and, therefore, the invention, as defined by independent claim 49, is patentable over Saito, DeLange, Mercer, Colombo, David, Finicle, Bullough, Bahney, Ueno, Leycuras, Natelson, Bacchi, and any combination thereof.

The Applicant submits that claims 50-59, 63-78, 81-83, and 92-100, all of which depend either directly or indirectly from independent claim 49, and therefore include all of the limitations of independent claim 49, are also patentable over the prior art as they depend from allowable subject matter.

The Applicant further submits that Saito, DeLange, Mercer, Colombo, David, Finicle, Bullough, Bahney, Ueno, Leycuras, Natelson, Bacchi, and any combination thereof, do not

disclose, teach, or suggest a liquid metal evaporation source comprising “an evaporator for the growth of high purity semiconductor layers, wherein said evaporator comprises a first heater element of a plurality of heater elements for maintaining a first temperature”, “a transport tube, said transport tube comprises a second heater element of said plurality of heater elements for maintaining said transport tube at a second temperature”, “a reservoir with a piston, wherein said reservoir comprises a third heater element of said plurality of heater elements for maintaining said reservoir at a third temperature, wherein second temperature being less than said first temperature and said second temperature being greater than said third temperature”, “a cone-shaped vapor orifice disposed at said evaporator, wherein said cone shaped vapor orifice comprises a fourth heater element of said plurality of heater elements for maintaining a fourth temperature”, “at least two conducting probes, a first conducting probe disposed at said evaporator for sensing a height of a liquid metal in said evaporator, and a second conducting probe disposed at said cone-shaped vapor orifice for sensing a height of said liquid metal in said orifice”, “wherein said first probe is in thermal communication with said evaporator and said second probe is in thermal communication with said cone-shaped vapor orifice to maintain said height of said liquid metal in said evaporator, said first and said second probes communicating with said piston to control a flow of said liquid metal to said evaporator”, “wherein said first heater element, via a first thermocouple, senses and regulates said first temperature”, “wherein said second heater element, via a second thermocouple, senses and maintains a second temperature, and said third heater element, via a third thermocouple, sense and maintains a third temperature”, “wherein each of said plurality of heater elements heat said evaporator, said transport tube and said reservoir by infrared radiation to prevent solidification of liquid metal in said evaporator, said transport tube and said reservoir”, “wherein said evaporator, said transport



tube and said reservoir are in fluid communication”, “wherein said reservoir cylinder, said transport tube, and said evaporator are integrally connected within a vacuum system configured to melt, transport, and evaporate liquid metal at very high temperatures up to 2500 C”, all of which are specifically recited features of independent claim 101.

In view of the foregoing, the Applicant respectfully submits that Saito, DeLange, Mercer, Colombo, David, Finicle, Bullough, Bahney, Ueno, Leycuras, Natelson, Bacchi, and any combination of same, do not disclose, teach, or suggest, all of the specifically recited features of independent claim 101, and, therefore, the invention, as defined by independent claim 101, is patentable over Saito, DeLange, Mercer, Colombo, David, Finicle, Bullough, Bahney, Ueno, Leycuras, Natelson, Bacchi, and any combination thereof.

The Applicant submits that claims 102-113, 115-131, 133-135, and 144-155, all of which depend either directly or indirectly from independent claim 101, and therefore include all of the limitations of independent claim 101, are also patentable over the prior art as they depend from allowable subject matter.

### **III. CONCLUSION:**

In view of the foregoing, the application is deemed to be in condition for allowance and action to that end is respectfully requested. Allowance of pending claims 1-4, 8-19, 21-24, 26-31, 40-59, 63-78, 81-83, 92-113, 115-131, and 133-155 is, therefore, respectfully requested.

Should any changes to the claims and/or specification be deemed necessary to place the application in condition for allowance, the Examiner is respectfully requested to contact the undersigned attorney to discuss the same.

Respectfully Submitted,

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